



TOWN OF BROOKLINE

Massachusetts

DEPARTMENT OF PUBLIC WORKS PARKS AND OPEN SPACE DIVISION

Erin Chute Gallentine
Commissioner

Alexandra Vecchio
Director

Memorandum

To: Brookline Select Board
Brookline Advisory Committee
School Committee

From: Alexandra Vecchio, Director of Parks and Open Space
Erin Chute Gallentine, Commissioner of Public Works

Date: March 29, 2022

Re: Warrant Articles 23 and 24

Cc: Linus Guillory, Superintendent of Schools
Leigh Jackson, Director of Recreation
Sigalle Reiss, Director of Health and Human Services

The Department of Public Works - Parks and Open Space Division manages and maintains natural grass and synthetic turf fields for the athletes and general field users of the community. The Recreation Department schedules use of all the Town's athletic fields, including those programmed for high school athletics. This memo includes background information on Brookline's athletic fields, turf management practices, field use, PFAS (as it relates to synthetic turf), and current design specifications for future replacement of synthetic turf fields.

In an attempt to address recent questions about synthetic turf fields, the Parks and Open Space Division, in collaboration with the Parks and Recreation Commission, developed a *Frequently Asked Questions* (FAQ) document about our natural and synthetic turf fields. The FAQs are attached to this memorandum and include more details pertaining to the health, safety, and environmental questions related to synthetic turf fields. It should be noted that the Park and Recreation Commission have purview over Town-owned parks and playgrounds and have a role in major capital improvements of those spaces. The School Committee has jurisdiction over school properties and oversee those capital improvements through a process with the Building Department and Building Commission. DPW helps provide the long-term maintenance and management of all of these properties.

Overview of Brookline's Athletic Fields

As presented in the [2020 Athletic Fields Needs Assessment and Master Plan](#), (AFNAMP), Brookline currently has a deficit of athletic fields within the Town's overall recreation field inventory. The report concludes that the Town requires an increased inventory of athletic field space to meet the specific athletic and fitness needs of the community, both today and for future demands. The athletic fields in Brookline see nearly 30,000 hours of regular scheduled use

annually, not including additional usage by the Green Dog off-leash program, or walk-in, casual unscheduled or un-permitted usage. Many groups are turned away each year and permit requests are denied due to lack of athletic field space.

The Town has 25 athletic fields in total, seventeen (17) of which are diamond (baseball/ softball) fields and eight (8) are rectangular fields (soccer, football, field hockey, lacrosse). These fields are spread throughout various parks and school grounds. Many fields are significantly undersized or non-conforming, therefore do not meet regulation standard sizes. The following table from the AFNAMP represents Brookline's regulation-size natural and synthetic turf athletic fields.

Regulation-Size Athletic Facilities	
Diamonds - 90' Baseline	
Amory Playground	Little League Baseball
	High School Baseball
Warren Field	Little League Baseball
	High School Baseball
Diamonds -60' Baseline	
Baker School	Little League Baseball
Brookline Ave Playground	Mens' Softball
Cypress Field	Girls' Softball
	Little League Baseball
Downes	Little League Baseball
Rectangular Athletic Fields	
Cypress Field	High School Soccer
Downes Field (Synthetic)	Boys' Lacrosse
	Girls' Lacrosse
	Football
	High School Soccer
	Field Hockey
Downes Field (Grass)	Boys' Lacrosse
	Football
Fisher Hill Reservoir Park	Youth Soccer
Larz Anderson Park	Girls' Lacrosse
	Field Hockey
Ridley School (Synthetic)	Youth Soccer - 7v7
Skyline Park (Synthetic)	High School Soccer
Soule (Synthetic)	Youth Soccer

Athletic fields are in high demand in Brookline. There are numerous field user groups, including K-8 schools, high school athletic programs, recreation adult and youth sports programs, camps, and community members, all who desire quality athletic fields to support their specific uses and needs. Many of Brookline's athletic fields are overlaid fields consisting of both rectangular and diamond shaped fields in the same space. While this allows these fields to be multi-purpose, this situation also leads to a misperception regarding the number of athletic fields available for use. Typically, activities that would occur on a rectangular athletic field cannot occur at the same time as the diamond field is being used. The table below from the AFNAMP shows Brookline's rectangular and diamond fields and highlights those that are overlay fields.

Adult Rectangle	Youth Rectangle	Non-Programmed Open Turf Areas
Downes Field Synthetic	Ridley School	Boylston Street Playground
Skyline Park	Soule Synthetic	Heath School
Cypress Playground	Fisher Hill Reservoir Park	Pierce Playground
Downes Field Grass	Soule Grass	Runkle School
Larz Anderson Park	Baker School	Winthrop Square
Brookline Ave Playground	Warren Field Major	
	Margaret E Robinson	
	Waldstein Playground	
Shading represents an overlay field with limited availability		
Adult Diamond	Youth Diamond	Non-Programmed Diamond Practice Areas
Amory Playground (Tennis Court)	Baker School	Lawrence School/Longwood 2
Warren Field Major	Brookline Ave Playground	Boylston Street Playground
	Cypress Field 1	Pierce School
	Cypress Field 2	
	Downes	
	Amory Playground Parking Lot	
	Warren Field Little	
	Larz Anderson 1	
	Larz Anderson 2	
	Margaret E Robinson Park	
	Waldstein Playground	
	Lawrence School/Longwood 1	

Brookline Field Use

The average spring-to-fall usage of any given athletic field in Brookline is over 1,000 hours. These hours of use vastly exceed industry standards for maintaining safe turf quality conditions. Natural turf athletic fields have limitations for continuous or intense athletic field use, even with the implementation of highly sophisticated maintenance practices.

The table below indicates often-referenced industry standards for expected natural grass turf conditions and associated hours used annually.

Expected Field Condition	Field Use (Hours per Year)
Sustained good field conditions	200 hours or less
Good Field conditions with some thinning of the turf and localized wear areas	400 to 600 hours
Fair field conditions; expect significant thinning and wear	800 to 1,000 hours
Significant turf loss, field surface damage, increased potential for athlete injury	More than 1,000 hours

(Maximizing the Durability of Athletic Fields, Grady L. Miller, North Carolina Cooperative Extension publication AG-726-W 01/2010 BS)

Natural turf athletic fields, under ideal conditions, should be limited in the hours upon which they are played. This allows them to recuperate and allows for the grass to be maintained in a healthy and vigorous condition that adequately supports regular recreational use and meets the

expectations of the community. Natural turf fields should not be played upon when the grass is dormant or wet, as this leads to soil compaction and turf root damage. Ideally, natural turf fields should also be “rested” by taking a field completely out of play for a growing season, to allow for complete turf regeneration.

Synthetic Turf Fields

Given the user needs and space limitations, synthetic turf fields are utilized in town to better meet the community demand for athletic field space.

The Parks and Open Space Division currently maintains a synthetic turf field at Skyline Park, Soule Recreation (lower field), Harry Downes Field, and the Ridley School. Skyline Park and Harry Downes are considered regulation sized fields, while Soule and Ridley fields are not. Once completed, the new Driscoll School will also contain a synthetic turf field, less than regulation size. The following table summarizes the current synthetic turf fields, year installed, and synthetic turf products within Brookline’s inventory.

Location	Year Installed	Field System	Manufacturer
Skyline Park	2008	Synthetic turf field with sand/ SBR rubber infill over stone subbase with underdrains	FieldTurf
Soule Recreation	2011	Synthetic turf field with sand/ SBR rubber infill over stone subbase with underdrains	FieldTurf
Harry Downes	2019	Synthetic turf field with sand/ organic infill over shock pad over stone subbase with underdrains. Synthetic turf carpet and shock pad were replaced in 2019 over existing subbase, previously installed in 2006.	GreenFields
Ridley School	2020	Synthetic turf field with sand/ organic infill over shock pad over stone subbase with underdrains.	Shaw

Synthetic turf fields allow for early spring (March) and late fall (November) play, often referred to as the “shoulder seasons”, while also allowing continuous use during and after rain events. They are not fertilized or watered (the exception for watering is fields with natural infill may require very infrequent watering to maintain moisture levels in the infill, possibly twice a year). Synthetic turf fields provide all-weather athletic performance, intended to withstand extended and intense use without a need for downtime to recover. Underneath the turf, the subsurface of these fields is most often designed with a layer of crushed stone and sub-drainage piping, which allows the overall system to absorb, store, and infiltrate, and or transport far greater amounts of precipitation compared to a natural turf field.

There are no new synthetic turf fields currently included in the Capital Improvements Plan, however there are replacements planned for the older fields (Skyline, the next up for replacement). As with all Parks projects, Skyline will go through a Design Review process for all of the proposed improvements to the park, inclusive of the synthetic turf field. The bid specifications for the project will include specific language regarding synthetic turf:

1. Will utilize only organic infill products. SBR rubber or other rubber infill shall not be utilized.
2. The product shall be created with the maximum ability for recyclability at end of life.
3. The product shall be stated by the manufacturer, with confirmatory testing to be provided, to be as PFAS free as practicable, with specific requirements to be defined.

Natural Turf Fields

Our natural turf fields are currently maintained on a basis of their hours of use. For many years, the town has not used pesticides or herbicides in treatments of our fields, sometimes creating challenges in combating weeds or common pests. Brookline fields are organically treated and maintained fields to the greatest extent possible. The table on the following page summarizes the various levels of maintenance the Parks and Opens Space Division currently practices for our natural turf fields.

BROOKLINE NATURAL GRASS MAINTENANCE CALENDAR (Tiers 1,2,3)

	<800 Hours Use Tier 3	<1000 Hours Use Tier 4	>1000 Hours Use Tier 5
Rectangles			
Field Paint Based on permit schedule	2 times/week Spring & Fall 1 time/week Summer	2 times/week Spring & Fall 1 time/week Summer	1 time/week
Mowing Frequency	2-3 times/week in the growing season	2 times/week in the growing season	1 time/week
Mowing Heights	2" cool season: 2 1/2" warm season	2" cool season: 2 1/2" warm season	2" cool season: 2 1/2" warm season
Field Perimeter Edging	2 times/month	1 time/month	Quarterly
Core Aerate	2 times/year - spot aerate high use areas as needed	2 times/year - spot aerate high use areas as needed	2 times/year - spot aerate high use areas as needed
Aerate/Seed	2 times/year - spot aerate high use areas as needed	2 times/year - spot aerate high use areas as needed	2 times/year - spot aerate high use areas as needed
Slice Seed/Roll	2-3 times/year: Spring/Summer/Fall Overseed base areas continuously	3-4 times/year: Spring/Summer/Fall Overseed base areas continuously	4 times/year: Spring/Summer/Fall Overseed base areas continuously
Pre-mixed seed/soil application	apply to heavily worn areas	apply to heavily worn areas	NA
Fertility/Lime	3 times/year: Late Spring/Fall/Late Fall	3 times/year: Late Spring/Fall/Late Fall	2 times/year: Late Spring/ Late Fall
Humates	1 time per year	1 time per year	1 time per year
Renovate Plus	1 time per year	1 time per year	1 time per year
Grass clippings	remove if visible	remove if visible	remove if visible
Thatch	inspect regularly/ remove as needed	inspect regularly/ remove as needed	inspect regularly/ remove as needed
Top Dressing/Aerate	1 time/year 2 mm sand; add compost as needed	1 time/year 2 mm sand; add compost as needed	1 time/year 2 mm sand; add compost as needed
Soil Compaction	Vertiquake/Deep Tine as needed	Vertiquake/Deep Tine as needed	Vertiquake/Deep Tine as needed
Irrigation	3 times per week – 1" Daily after seeding	3 times per week – 1" Daily after seeding	3 times per week – 1" Daily after seeding
Soil and Irrigation Water testing	Annually and as needed.	Annually and as needed.	Annually and as needed.
Insect and disease inspections	Weekly - limit impacts based on natural turf management approach	2 times per month - limit impacts based on natural turf management approach	Monthly - limit impacts based on natural turf management approach
Rest/Field Closure	As needed for weather 6 weeks for seeding every 3 years	As needed for weather 6 weeks for seeding every 4 years	As needed for weather 6 weeks for seeding every 5 years

Cool Season = day time highs consistently below 75 degrees

Warm Season = day time highs consistently above 75 degrees

PFAS

This section was prepared in consultation with Weston and Sampson Engineers specializing in emerging contaminants and some of the latest regional trends and science related to synthetic turf fields today.

Background

Scientifically known as per- and polyfluoroalkyl substances, PFAS are man-made compounds that have been used in thousands of everyday consumer products and the manufacturing industry since the 1940s. PFAS have been classified by the U.S. Environmental Protection Agency (EPA) as an emerging contaminant on the national landscape. Due to their presence in so many products and their resulting environmental persistence, PFAS are now ubiquitous in the natural outdoor environment.

There are thousands of individual PFAS compound variations. By design, many PFAS are water and oil resistant, are durable and do not degrade under natural conditions. Other PFAS are soluble and may degrade under typical natural conditions. These properties have resulted in PFAS being utilized in daily use products including food packaging, cookware, and waterproof textiles used in jackets and shoes, as well as firefighting foams, surgical implants and water filtration equipment.

Federal and State Regulations

For the context of PFAS exposure, the EPA and other regulatory agencies are primarily concerned with the effects of human consumption of soluble PFAS in drinking water. The Massachusetts Department of Environmental Protection (MassDEP) currently regulates six specific PFAS compounds in soil and drinking water. This group includes: perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorononanoic acid (PFNA), perfluorohexane sulfonic acid (PFHxS), and perfluorodecanoic acid (PFDA). These PFAS are soluble in water and are shown to accumulate in humans, animals, and plants. Currently, available research studies indicate PFAS pose a minimal health risk due to dermal (skin) contact. Similarly, most PFAS compounds do not appear to be volatile and are expected to pose minimal health risk through inhalation.

Currently, there are no federal standards or regulatory limits set for consumer products containing PFAS. The European Union regulates chemicals contained in consumer products via the Registration, Evaluation, Authorization, and restriction of Chemicals (REACH) regulation. REACH is a European Union regulation (1907/2006/EC) restricting the levels of specific chemical substances in all imported goods. PFOS and PFOA are listed as restricted compounds by REACH.

In the United States, California Prop-65 provides a list containing a wide range of naturally occurring, organic and synthetic chemicals that are known to cause cancer or birth defects or other human health harm. If a product contains chemicals on this list, a warning must be provided on the product. PFOA and PFOS have been on the Prop-65 list since 2017. As of December 31, 2021, PFNA and PFOS transformation and degradation precursors were added to the Prop-65 list. None of these compounds have been reported as being utilized in the synthetic turf products, nor do data from turf product testing show reportable levels of these specific PFAS.

Synthetic Turf and PFAS

As a result of PFAS being known to be a component in the creation of plastic, several municipalities in New England have engaged in synthetic turf sampling and analyses for PFAS, including the 6 specific PFAS compounds currently regulated by MassDEP. The results indicate low levels of soluble PFAS in some synthetic turf system components. The concentrations of these PFAS compounds were similar to those seen in soils in undeveloped forest lands, often referred to as “background” concentrations. Such concentrations are most often a factor of rainwater or other atmospheric deposition. The PFAS concentrations in synthetic turf samples are not indicative of their use as a manufacturing additive, which would be expected at much higher concentrations. The research also indicates that there is not an increased risk of soluble PFAS exposure to humans or the environment due to synthetic turf fields.

However, synthetic turf does likely contain additives which are in the PFAS family. It is not likely that a synthetic turf field system will be completely PFAS free, by the pure scientific definitions of a PFAS compound. Synthetic turf grass filaments are made by extruding a mixture of primarily polyethylene plastic shaped as blades of grass. Typically, a processing agent is utilized within the polyethylene mixture to assist with effective plastic injection and ease removing the filament from the manufacturing equipment. The predominant processing agent being used by the

synthetic turf manufacturers is the copolymer polyvinylidene fluoride-co-hexafluoropropylene (PVDF-HFP), which is a polymeric PFAS (polymeric compounds generally contain large molecules). This PVDF-HPV copolymer is a very large molecule and is not soluble in water. Because the processing aid is mixed into the plastic being extruded, it is bound into the polyethylene filament as part of the plastic composition.

A review of PVDF-HFP does not reveal any relevant toxicity data. There is no reference to PVDF-HFP in EPA Integrated Risk Information Systems (IRIS) or the CDC's Agency for Toxic Substances and Disease Registry (ATSDR). This is likely because PVDF-HFP is considered inert. PVDF-HFP is a common component used in medical devices – stents, meshes, replacement joints, etc. Based on current information, high molecular weight PVDF-HFPs are believed to be too large to cross cell membranes and therefore believed to pose less risk to human and ecological health.

Conclusion

As noted above, there are no new synthetic turf fields included in DPW's Capital Improvement Plan. There are, however, currently two proposed replacements of existing synthetic turf fields including Skyline Park and Soule Recreation. Skyline is proposed to begin redesign in FY 2023 with construction anticipated in FY 2024. Soule Playground is currently included in FY 2027 in the CIP. Based on our understanding of PFAS today, and with consultation of Weston and Sampson Engineers, the Town has determined we could not replace the fields we have and meet the criteria of Warrant Article 24 based on the specificity of the testing methods prescribed. The proposed warrant article requires a "Total Organic Fluorine test." Through consultation with Weston and Sampson, using "total organofluorine" analyses will not report the actual concentrations of PFAS. These analyses report total organofluorine, which does not correlate to a type or concentration of any individual PFAS. These tests do not discern between soluble PFAS, polymer PFAS or non-PFAS related organofluorine. The total organic fluorine method is not standardized and can also identify non-PFAS related fluorine.

Given the testing requirements outlined in WA24, any field replacements occurring after June 1, 2025 would not include synthetic turf. Removing synthetic turf playing fields would require reduced programming of athletic fields for all user groups, elimination of some programs, additional costs for field rental space in other communities, and, very likely, delay the start of recreation programs in March, as well as lead to an earlier end time in the Fall.